APPENDICES

With the

Advice on Terms of Reference (ToR) for a combined EIA/Feasibility study for Rehabilitation of the Chorokhi River and Batumi Coast in Adjara, Georgia

(appendices 1 to 6)

APPENDIX 2

Letter dated 10 January 2007
from the Minister of Environment, Protection and Natural Resources of Georgia, in which the Commission's assistance is requested.

OS25-069-007

საქართველოს გარემოს დაცვისა და ბუნებრივი რესურსების მინისტრი

MINISTER OF ENVIRONMENT PROTECTION AND NATURAL RESOURCES OF GEORGIA

„10" „01" 2006წ.
№08/2-06/36

To: Ms Diependaal

Director of the Netherlands Commission for Environmental Assessment

P.O Box 2345;3500 GH Utrecht;
The Netherlands

Dear Ms Diependaal,

Please accept my gratitude to the Netherlands EA Commission for the support extended to Georgia over years. With this letter I would like to inform you about a particular request of our Ministry.

As you may be aware Georgia does share the basin of the trans-boundary river Chorokhi with Turkey which owns the upstream area of the basin. In 1990s, Turkey had initiated extensive infrastructural project with the construction of several dams on the Turkish side of the river Chorokhi. The EIA on the latest of those - Yusufeli Dam - has been developed and published recently on the web. It provides valuable information on the changes this particular dam will introduce to the lower reaches of the river.

Still, the impact that the cascade as a whole can have on the downstream environment of Georgian territory needs to be assessed further, as the measures against possible alteration of riverine and coastal ecosystem need to be developed and implemented. I would kindly request your assistance in the process of drafting terms of reference for the Environmental Assessment for the EIA plan for the development of Chorokhi river watershed. For the preparation of this ToR I would like to ask you to review the existing available information.

I am looking forward towards the continuation of our successful cooperation.

Yours sincerely,

David Tkeshelashvili
Minister

სახ.თბილისი, 0114 თბილისი, გ. გულუას ქ. №6 275700 275720 ფაქსი:275737
6 Gulua str, 0114, Tbilisi, Georgia, (+99532) 275700 275720 Fax:275737 E-mail:ministry@moe.gov.ge

APPENDIX 3

Project information

Proposed activity: Protection of the coast at Batumi. Batumi is the administrative centre of the autonomous republic of Adjara and has a population of approximately 130.000 inhabitants. It is one of the most important tourists sites along the Georgian Black Sea coast attracting a growing number of national and international tourists. However, the coastline southwest of Batumi is affected by serious erosion over a length of about five km. Along this section a number of houses and cultivated land has been lost already. Seven kilometres south of Batumi the Chorokhi River flows into the Black Sea. Without adequate protection measures coastal erosion will continue and might even affect the beaches and the coastline of Batumi.

A combined Environmental Impact Assessment (EIA) / feasibility study will be conducted aiming to (i) come up with a feasible solution for the long term protection of the coastline of Batumi and (ii) establish an emergency preparedness plan for the people living in or near the riverbed of the Chorokhi River for whom flooding risks will change. In this study a number of alternatives will be studied and compared.

Categories: River erosion, coastal erosion and protection

Project numbers: Commission for Environmental Assessment 069, DCD/DAC code: 14040 River Development / 14010 Water resources policy and administrative management

Progress: On request of the Minister of Environment, the NCEA has prepared an advisory report for Terms of Reference for a combined EIA / feasibility study for protection of the coast at Batumi. The advisory report has been submitted to the Minister on the 17th of April 2007. The advisory report is also available in the Georgian language.

Composition of the working group of the Commission for Environmental Assessment:

Klaas Jan Beek (chairman)

Hermjan Barneveld

Jan van Overeem

Technical secretary:

Arend Kolhoff

APPENDIX 4
Programme of the site visit to Georgia, 28 January – 3 February 2007

28 January; Sunday	- 12.40: Departure of the working group from the Netherlands
29 January; Monday	- 00.15 Arrival working group of NCEA - 10.00: Meeting at the Ministry of Environment with: Sophiko Akhobadze (deputy Minister) Zaal Lomtadze (deputy Minister) George Jaoshvili (deputy Head centre for monitoring and prognostification) - 13.00: Departure by car to Batumi
30 January; Tuesday	- 10.00 Meeting at regional office of MoE in Batumi Irakli Goradze (Head of Directorate for Environment and natural resources of Adjara Autonomous republic) - 11.00 Site visit Chorokhi river, river mouth and Batumi coastal area - 19.00 Diner with representatives of Directorate for Environment and Natural Resources
31 January; Wednesday	- 09.00 Continue site Batumi coast - 10.00 Meeting at regional monitoring centre - 12.00 Meeting with: Levan Varshalomidze (Chairman of government of Autonomous Republic of Adjara) - 15.00 Meeting - 22.00 Night train to Tbilisi
1 February; Thursday	- 10.00 Meeting at Centre for monitoring and prognostification - 13.00 Meeting at Caucasus Environmental NGO Network (CENN) - Preparation of report
2 February; Friday	- 10.00 Presentation of main findings at MoE - Sophiko Akhobadze (deputy Minister) - 12.00 Meeting with Eka (Black Sea Eco-academy) - 18.30 Debriefing at Netherlands Embassy - 19.30 Diner at Netherlands Embassy with: Irakli Goradze (Minister of Environment, Georgia) Sophiko Akhobadze, (deputy Minister of Environment) Ertan Tezgör (Ambassador of Turkey) Onno Elderenbosch (Ambassador of The Netherlands) Janet Alberda (First Secretary) Working group of the NCEA
3 February; Saturday	- 05.50 Departure to the Netherlands

APPENDIX 5

Available information

1.1 Studies performed in the past

A number of studies have been performed in the past. They have been listed below and a summary is given of some of the studies.

- Russo G, Jaoshvili G, Migreli, 2007, Development of the physical impact of the Chorokhi River. Paper under preparation.
- Encon (2006), Environmental Impact Assessment Yusufeli Dam and HEPP-project. Ankara, July, 2006.
- Arcadis, Alkyon, HKV Consultants, 2000, IMWM Project in Georgia, coastal protection study for Batumi, June 2000.
- Jaoshvili S.V., 1997, Expected changes in the river bed of Chorokhi River caused by dam construction (in Georgian), memorandum prepared by S.V. Jaoshvili
- Jaoshvili S.V., 1997, Hydrological Analysis of lower part of Chorokhi, short memo (date unknown)
- Sakvarelidze V., 1997, Influence of the regulation of the Chorokhi River flow on the stability of Azharian Coast – Synopsis of the Programme, Memorandum by the Director of the Scientific-Research Institute of the Sea Coast and River Bank Morphodynamics (Saknapirdatsva)
- Sakvarelidze V., Jaoshvili S.V., Russo G., 1997, Study on the current processes in the river bed of Chorokhi and along the coastline (in Georgian), Scientific Research Institute of the Sea Coast and River Bank Morphodynamics (Saknapirdatsva)
- SIA "Gruzmoreregozashchita", 1987, Study of sediment balance around water dividing junction and real transport ability of City Channel, Science-Industrial Association for the studying and protection of Black Sea Coastal Zone, Tbilisi

In Arcadis et al (2000) the influence of dam construction and sediment mining on annual sediment loads from Chorokhi is assessed. For this an analytical approach has been applied based on monthly average river discharges, assumed operation rules for the Turkish dams and expected critical discharges for sediment transport. The analysis predicts an rapid reduction of beach forming material load at the mouth, causing increased coastal erosion.

Encon (2006) describes the Environmental Impact Assessment Study for Yusufeli dam including the impact on regime and sediment loads downstream of the series of constructed and proposed dams in the Chorokhi River (Muratli, Borchka, Deriner, Artvin and Yusufeli). The study shows that the dams trap (almost) all river sediments. Sediment loads to the Georgian part of Chorokhi River then only originate from Georgian tributaries. Although the effects of the dams on river and coastal morphology are described qualitatively, the combined effect of sediment trapping in the reservoirs and changed river regime on sediment loads and coastal erosion is not quantified in Encon (2006).

Based on measurements at Erge, Mirveti and Muratli in the period the Monitoring and Prognostication Centre did some analyses on morphological changes in the river (erosion since 2000) and sediment loads (reduction since 2000). It must be noted that these con-

clusions are based on a limited data set. In addition the coastline erosion since 2000 is reported which appears to be in line with the predictions of the so-called do-nothing alternative of Arcadis et al (2000).

1.2 Available data

1.2.1 Coastal area

The following information of the coastal zone of Batumi is reported to be available at the Centre for Monitoring and Prognostication of the Ministry of Environment and Natural Resources.

Historical coastlines

- Coastlines of the area between Chorokhi river and the Batumi Cape of the years 1834, 1880, 1906, 1926, 1969, 1979, 1989, 1991, 1999, 2000 and 2007.

Coastal profiles

- Coastal profiles of almost the entire coastal zone between Chorokhi River and Batumi Cape at a distance of 70 m to 100 m in the period 1977 to 1991. The slope of the profile at the airport is 1 : 6 to 1 : 9 between the waterline and a depth of 4 m. Further seaward the slope becomes 1 : 36 and even more gentle.
- In total 24 coastal profiles were measured during the coastal protection study for Batumi (Arcadis et al, 2000) in July and August 1999. The area concerned the coastal stretch between Gonio at 4 km south of the Chorokhi River and Batumi Cape. The length of coastline is approximately 12 km. The distance between successive profiles is 500 meters.
- Coastal profiles were measured near the airport in 2003 and 2006.
- Near Batumi Cape coastal profiles have been measured in 2007.

Bathymetry

- Various surveys of the canyons at the mouth of the Chorokhi River and the groyne at NW edge of shingle beach.
- Between groyne at NW edge of shingle beach and the marina. Scale 1:500. 1996.
- Spit development north of Chorokhi River after shingle nourishment in 1979, 1980, 1984, 1985, 1987, 1988, 1990 (Batumi report, 1990).
- The coastal area between the Gonio settlement south of the Chorokhi River to the Batumi Cape was surveyed in the year 1999. Data are available in hard copy at a scale 1:1000.
- The coastal area between Adlia and Batumi Cape was surveyed in 2003. Data are available in GIS format.
- The coastal area between at Adlia and at Batumi Cape was surveyed in 2006. Data are available in GIS format.

Wave and wind

- Visual wave observations at Batumi during the period 1960 to 1980.

Water levels

- Sea levels (minimum, average, maximum) for the years 1874 - 1979. Relative sea level rise at Batumi is 0.40 to 0.48 m per century.
- Seasonal water level fluctuations.

Sediment sizes

- Average grain size of beach material along the coastline of Batumi in 1982, 1988, 1990 and 1993 at three locations (100 m and 1500 m south of Batumi Cape and at Adlia, see "Study on the current processes in the river bed of Chorokhi and along the coastline, Scientific Research Institute of sea and river, coastline defence Saknapir-datsva" by S.V. Jaoshvili and G. Russo, 1997). Also in 2006 samples were taken at the same locations where the previous samples were taken.
- Bed samples were collected in 1999 (Arcadis et al, 2000) in 4 profiles. The samples were taken at the waterline and at a depth of 5 meters.

Topographical Charts

- Topographical charts for the area of Batumi are available.

Photographs

- Various photographs have been taken of the beaches at Adlia before and after the artificial nourishment of gravel.
- Aerial photographs are available from the year 2001.

Various

- S-ϕ curve for the Batumi coastal area for various gravel sizes (made by I. Papashvili).
- Volumes of shingle nourishment at Batumi between 1982 and 1990 (Batumi report, 1990).

1.2.2 Chorokhi River

Figure 3.1 shows the locations were measurements are and have been carried out. These measurements are described below. Georgian institutes carry out part of the measurements. In addition measurements are carried out by Turkish experts within the context of a joint monitoring programme initiated in 1996 and proposed to continue until 2014. Objectives of this programme are to identify the reference situation (before dam construction) and to monitor the effects of reservoir sedimentation on the Georgian part of Chorokhi and the Black Sea Coast.

Figure 3.1 Locations of measuring sites in Chorokhi River

Water and sediment loads

Table 3.x shows the available measuring data in Chorokhi River in Georgia.

Gauging station	River	Period	H	Q	Ss
Erge	Chorokhi	1930-1991		X	
		1938-1991	X		
		1930-1935 & 1955-1991			X
Mirveti	Chorokhi	1969-1991			X
		1969-present	X	X	
Sindieti	Matschakhela	1951-1991	X	X	X
Keda	Adjaristskali	1940-1969 & 1971-1991	X	X	X
AtsGES	Adjaristskali	1955		X	

H: Water level (m+REF), measured 1 or 2 times per day

Q: Water discharge (m^3/s), calculated using a rating curve (Q function of H)

S: Suspended load (m^3/s)

Note 1: an automatic gauging station was also installed at Mirveti by Turkey in 1999. This station was destroyed shortly after installation.

Note 2: Erge gauging station was completely destroyed during a recent flood. At present no measurements are possible.

Note 3: since 1991 the rating curve at Mirveti was not changed. Calculated discharges of last 10 years are expected to be less reliable.

Table 3.x. Gauging stations Chorokhi in Georgia

In addition following derived information is available:

- Average discharges of tributaries;
- A frequency/recurrence table for Erge station;
- A graph with annual peak discharges Erge station upto 1980;
- A graph with average annual suspended sediment loads and discharges Erge station, up to 1991;
- Main hydrological parameters of the lower Chorokhi river are available;
- A graph with average annual suspended sediment loads and discharges Erge station, up to 1991.

Cross-sections and elevation data

Apart from a general long-section of the river, cross-sections are available at (from mouth upstream) Gonio, Makho, Erge and Mirveti stations:

- Gonio: 1999
- Makho: 2006
- Mirveti: 1969, 1970, 1975, 1980, 1985, 1991, 1999 and 2006 (May and June). Also a cross-section for 2003 should exist from Turkish source.
- Erge: 1970, 1975, 1980, 1985, 1991, 1999 and 2006. Also a cross-section for 2003 should exist from Turkish source.

And in the Georgian tributaries:

- Sindieti at Matschakhela: 1990, 1991 and 2006
- Keda at Adjaritskali: 1970, 1975, 1980, 1986, 1990 and 2006

From 2007 onwards measuring of cross-sectional profiles are planned twice a year (before and after the flood).

Bed material

Bed samples (sieve curves) are available for Gonio/mouth (1993-1999 and 2006), Erge (1999), Makho (1989-1997) and Mirveti (July 1999).

Sediment mining

Official amounts for sediment mining are available as indicated in Chapter 2.

Turkish data

From the joint monitoring programme (Georgia-Turkey) in addition to the above the following data-sources are available:

- Daily water levels at Mirveti (2000-2005). Origin of the data is an automatic data logger. The measuring frequency of the raw data is not known. Somewhere in 2006 the automatic measuring station was destroyed. The measuring station is not recovered;
- Bi-annual measurements at Erge, Ajara (Adjaritskali), Machakhela (Matschakhela) and Muratli (just downstream of dam) of water level, water discharge, sediment load since 2000. Measurements are available in Georgia until November 2004. From 2004 onwards measurements 4 times per year were announced. Results are not available yet in Georgia.
- Height contour lines are available for the Chorokhi dry-river bed for 2003.
- Although the monitoring programme provides relevant information for the impact assessment of the dams, it is the impression that:
  - Communication on activities and exchange of data and analyses are laborious.
  - Georgian experts are not completely informed on the executed measurements and collected data sets.

  We feel this situation does not contribute to effective assessment of processes and impacts and fruitful discussions on possible solutions. We recommend a more pro-active and involved attitude from specialists of both countries so as to re-establish the intended co-operation and information and knowledge exchange on the basis of equality.

In addition data is available on the operation of the cascade of dams (Encon, 2006).